

What is claimed is:

1. A method of forming an isolation film in a semiconductor device, comprising the steps of:

5 sequentially forming a pad oxide film and a pad nitride film on a semiconductor substrate;

removing the pad nitride film and the pad oxide film on an isolation region so that protrusions of a tail profile are formed at the top corners of the isolation region;

10 etching the semiconductor substrate of the isolation region, while using the protrusions as an anti-etch film, to form a trench the top corners of which are made rounded; and

burying the trench with an insulating material and then removing the pad nitride film and the pad oxide film on the semiconductor substrate to form an isolation film.

15 2. The method as claimed in claim 1, wherein the protrusions are formed by implementing an over-etch process using a CHF_3 gas during 1 ~ 10% of time taken to remove the pad nitride film after the pad nitride film in the isolation region is removed.

20 3. The method as claimed in claim 1, wherein the protrusions are formed by implementing an etch process with a high selectivity ratio to oxide in the etch process for removing the pad nitride film and the pad oxide film.

25 4. The method as claimed in claim 3, wherein the etch process is implemented using a CF_4 gas and a CHF_3 gas as an etch gas and wherein the CHF_3 gas is more supplied than the CF_4 gas so that the selectivity ratio to oxide is increased.

5. The method as claimed in claim 4, wherein the supply ratio of the CHF_3 gas and the CF_4 gas is 2:1 ~ 10:1.

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6. The method as claimed in claim 3, wherein the etch process is implementing by setting a time point when an oxide component of the pad oxide film is detected as an end of point (EOP).

5 7. The method as claimed in claim 1, wherein a photoresist pattern is formed on the pad nitride film in order to define the isolation region, and wherein the photoresist pattern is removed before the trench is formed after the pad nitride film and the pad oxide film on the isolation region are removed, so that polymer occurring from the photoresist is prevented to affect an etch process for forming the trench.

10 8. The method as claimed in claim 1, wherein the etch process for forming the trench is implemented in-situ with no time delay at the etch chamber by which the pad nitride film and the pad oxide film are removed, in order to prevent a native oxide film from being formed on the semiconductor substrate of the isolation
15 region.

9. The method as claimed in claim 1, wherein the etch process for forming the trench includes the steps of:

performing a first etch process for the semiconductor substrate only with a
20 process condition having a high selectivity ratio to the protrusions to form the trench the top corners of which are not made rounded; and

performing a second etch process, using a post etch treatment (PET) with a process condition having a low selectivity ratio to the protrusions, to form etch tilt faces at the top corners of the trench while removing the protrusions, thereby forming
25 the trench that is made rounded.

10. The method as claimed in claim 9, wherein the etch selectivity ratio to the protrusions and the semiconductor substrate is controlled by adjusting the flux of an HBr gas among etch gases.

11. The method as claimed in claim 9, wherein in the first etch process, the semiconductor substrate only is etched by increasing the flux of the HBr gas and in the second etch process, the top corners of the trench along with the protrusions are etched by relatively reducing the flux of the HBr gas.